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Tubule Nanoclay-Organic Heterostructures for Biomedical Applications

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Abstract

© 2018 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim Natural halloysite nanotubes (HNTs) show unique hollow structure, high aspect ratio and adsorption ability, good biocompatibility, and low toxicity, which allow for various biomedical applications in the diagnosis and treatment of diseases. Here, advances in self-assembly of halloysite for cell capturing and bacterial proliferation, coating on biological surfaces and related drug delivery, bone regeneration, bioscaffolds, and cell labeling are summarized. The in vivo toxicity of these clay nanotubes is discussed. Halloysite allows for 10–20% drug loading and can extend the delivery time to 10–100 h. These drug-loaded nanotubes are doped into the polymer scaffolds to release the loaded drugs. The rough surfaces fabricated by self-assembly of the clay nanotubes enhance the interactions with tumor cells, and the cell capture efficacy is significantly improved. Since halloysite has no toxicity toward microorganisms, the bacteria composed within these nanotubes can be explored in oil/water emulsion for petroleum spilling bioremediation. Coating of living cells with halloysite can control the cell growth and is not harmful to their viability. Quantum dots immobilized on halloysite were employed for cell labeling and imaging. The concluding academic results combined with the abundant availability of these natural nanotubes promise halloysite applications in personal healthcare and environmental remediation.

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Keywords

drug delivery, halloysite nanotubes, self-assembly, toxicity

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